

# ALG I - §3-6 NOTES

## Algebra 1

### Lesson 3-6: Compound Inequalities

**Objective:** To solve and graph compound inequalities

**Warm-Up** Solve and graph each inequality.

1.  $5(3p - 2) > 50$

$$15p - 10 > 50$$

$$15p > 60$$

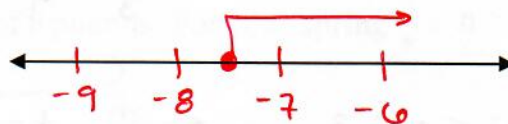
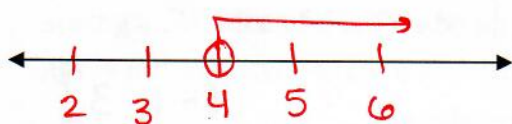
$$p > 4$$

2.  $-\frac{5}{4}(\frac{3}{2}n) \geq \frac{5}{4}(-\frac{4}{5}n)$  \*FLIP\*

$$-\frac{15}{2} \leq n$$

$$n \geq -\frac{15}{2}$$

$$n \geq -7\frac{1}{2}$$

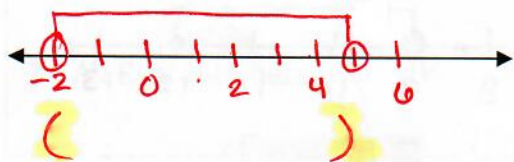


### COMPOUND INEQUALITIES: "AND" vs. "OR" statements

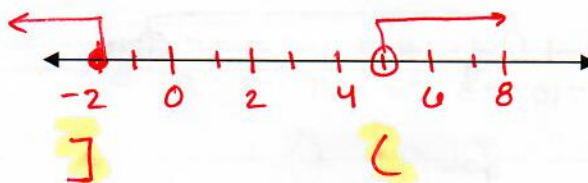
<p>"and" together</p>	<p>Conjunction or intersection</p>	<p>Graph <math>-3 &lt; x \leq 4</math></p>
<p>"or" apart</p>	<p>Disjunction or union</p>	<p>Graph <math>x \leq -3</math> or <math>x \geq 1</math></p>

**Example 1:** Graph  $-2 < x < 5$

$$x > -2 \text{ and } x < 5$$



**Example 2:** Graph  $x \leq -2$  or  $x > 5$



## Interval Notation

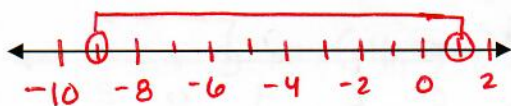
Inequality	Graph	Interval Notation
$x \geq 2$		$[2, \infty)$
$x < 2$		$(-\infty, 2)$
$1 < x \leq 5$		$(1, 5]$
$x < -3$ or $x \geq 4$		$(-\infty, -3)$ or $[4, \infty)$

**Example 3** Draw the graph and write the interval notation for each inequality.

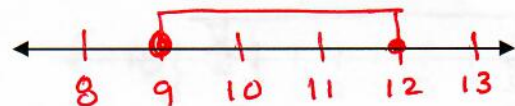
- a.  $x \geq 5$   $[5, \infty)$
- b.  $-1 < x \leq 3$   $(-1, 3]$
- c.  $x < 1$  or  $x \geq 4$   $(-\infty, 1)$  or  $[4, \infty)$

**Example 4** Solve and graph "AND" each compound inequality. Write the solution in interval notation.

- a) Solve  $-6 < x + 3 < 4$  *and  $\rightarrow$  together*
- $$\begin{array}{r} -6 < x + 3 \\ -3 \quad -3 \end{array} \quad \underline{\text{and}} \quad \begin{array}{r} x + 3 < 4 \\ -3 \quad -3 \end{array}$$
- $$-9 < x \quad x < 1$$
- $$x > -9$$
- b) Solve  $3 \leq \frac{n}{3} \leq 4$  *and  $\rightarrow$  together*
- $$3 \left( \frac{n}{3} \right) \leq \left( \frac{n}{3} \right) \quad \underline{\text{and}} \quad 3 \left( \frac{n}{3} \right) \leq (4)$$
- $$9 \leq n \quad n \leq 12$$
- $$n \geq 9$$



$(-9, 1)$



$[9, 12]$

→ apart

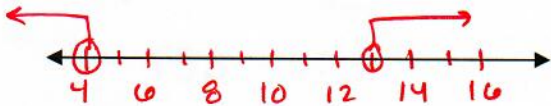
**Example 5** Solve and graph "OR" compound inequalities.  
Write the solution in interval notation.

a)  $\frac{2x < 8}{2} \text{ or } \frac{x - 1 > 12}{+1 \quad +1}$

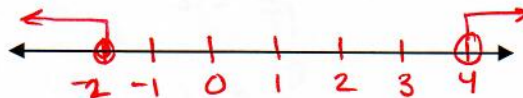
$x < 4 \quad x > 13$

b)  $\frac{-5n \geq 10}{-5} \text{ or } \left(\frac{n}{2}\right) > 2$

\*FLIP\*  $n \leq -2 \text{ or } n > 4$



$(-\infty, 4) \text{ or } (13, \infty)$



$(-\infty, -2] \text{ or } (4, \infty)$

**Example 6 (Stem problem 48 on p. 205):** The force exerted on a spring is proportional to the distance the spring is stretched from its relaxed position. Suppose you stretch a spring a distance of  $d$  inches by applying a force of  $F$  pounds. For your spring  $\frac{d}{F} = 0.8$ . You apply forces between 25 lb and 40 lb, inclusive.

Write an inequality that describe the distances the spring is stretched based on the force applied.

FORCE:  $25 \leq F \leq 40$

DISTANCE: If  $F = 25$

$\frac{d}{25} = 0.8$

$d = 20$

If  $F = 40$

$\frac{d}{40} = 0.8$

$d = 32$

Conclusion:

$20 \leq d \leq 32$

**Special Cases:**

1. No Solution

"AND"



2. All Real Numbers

"OR"





**Example 7** Determine if the compound inequality is "AND" or "OR."

Solve and graph each compound inequality.

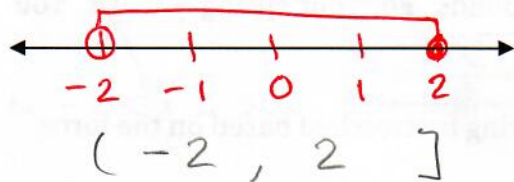
Write the solution in interval notation.

a)  $-8 < 4z \leq 8$

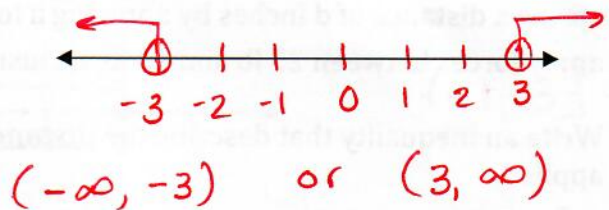
$$\frac{-8}{4} < \frac{4z}{4} \quad \text{and} \quad \frac{4z}{4} \leq \frac{8}{4}$$

$$-2 < z$$

$$z \leq 2$$

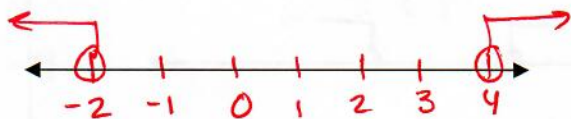


b)  $b - 12 < -15$  or  $\sqrt[3]{\frac{b}{3}} > \sqrt[3]{1}$   
 $\frac{+12}{+12} \quad \frac{+12}{+12}$   
 $b < -3$  or  $b > 3$



c)  $\frac{-15x}{-15} > \frac{30}{-15}$  or  $\frac{x+3}{-3} > \frac{7}{-3}$

$$x < -2 \text{ or } x > 4$$



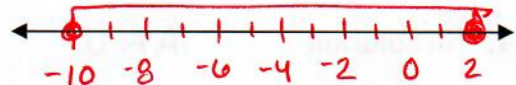
$$(-\infty, -2) \text{ or } (4, \infty)$$

d)  $-5 \leq \frac{f}{2} \leq 1$

$$\sqrt[2]{-5} \leq \sqrt[2]{\frac{f}{2}} \text{ and } \sqrt[2]{\frac{f}{2}} \leq \sqrt[2]{1}$$

$$-10 \leq f \quad f \leq 2$$

$$f \geq -10$$



$$[-10, 2]$$